STATE OF VERMONT

PUBLIC SERVICE BOARD

Joint Petition of Green Mountain Power Corporation, Vermont Electric Cooperative, Inc. and Vermont Electric Power Company, Inc. for a Certificate of Public Good pursuant to 30 V.S.A. § 248, to construct up to a 63 MW wind electric generation facility and associated facilities on Lowell Mountain in Lowell, Vermont and the installation or upgrade of approximately 16.9 miles of transmission line and associated substations in Lowell, Westfield and Jay, Vermont	)	Docket No. _____

PREFILED DIRECT TESTIMONY OF
DOUGLAS C. SMITH
ON BEHALF OF GREEN MOUNTAIN POWER CORPORATION

REDACTED VERSION

May 21, 2010

Summary of Testimony

Mr. Smith reviews GMP's existing power supply portfolio, its goals for new power supply arrangements, the projected future power supply costs, and how the proposed Kingdom Community Wind Project will help to meet GMP's power supply goals. Mr. Smith also explains why the Project meets the criteria of 30 V.S.A. § 248 with respect to need, economic benefit, and consistency with Green Mountain Power's Integrated Resource Plan and the 2005 Vermont Electric Plan, the electric energy plan approved by the Department.

PREFILED TESTIMONY OF DOUGLAS C. SMITH
ON BEHALF OF
GREEN MOUNTAIN POWER COPRPORATION

1. Q. What is your name, occupation, and business address?

A. My name is Douglas C. Smith. I am Manager of Energy Resource Planning and Rates at Green Mountain Power Corporation ("GMP" or the "Company"), 163 Acorn Lane, in Colchester, Vermont.

2. Q. Please describe your educational background and pertinent professional experience.

A. I have worked for over 20 years in the electric industry, focusing on topics that include electric system and portfolio planning, wholesale and retail power transactions, and market price forecasting. I hold a Bachelor of Science degree in Mechanical Engineering from Brown University.

I began my career as an analyst at the Vermont Department of Public Service and was subsequently promoted to the position of Electrical Planning Engineer. From 1991 to 2007, I worked at La Capra Associates ("La Capra"), a Boston-based consulting firm that specializes in planning and regulatory issues in the electric industry, first as an analyst and ultimately as the Technical Director. While at La Capra I advised several Vermont utilities regarding their power transactions, risk management strategies, and Integrated Resource Plans. On behalf of state agencies and large electricity customers, while at La Capra I reviewed the procurement strategies

of numerous large utilities in the eastern, central and western U.S. I also led the firm's forecasting of New England wholesale electricity market prices, and assisted in the siting applications of several proposed electric generating plants.

I joined GMP in May of 2007 as the Manager of Energy Resource Planning and Rates. In this capacity, I play a primary role in the development of the Company's power supply strategy, and in the evaluation of potential power supply sources. I also played a primary role in the development of GMP's 2007 Integrated Resource Plan (IRP), which was approved by the Board in Docket 7319.

3. Q. Have you previously testified before the Vermont Public Service Board ("Board")?

A. Yes, I have testified before the Board on numerous occasions, most recently in Docket 7533 (regarding the establishment of standard offer prices under the SPEED program) and Docket 7590 (regarding a proposed long-term power purchase from the Granite Reliable wind project). I have testified regarding topics that include resource planning, proposed power contracts, electric utility rates, and potential non-transmission alternatives to proposed transmission projects.

4. Q. What is the purpose of your testimony?

A. My testimony explains the rationale for the proposed Kingdom Community Wind project ("Project" or "Kingdom Project") from a power supply perspective, why the Project's output is needed, and how the Project is beneficial to GMP ratepayers and the state as a whole.

5. Q. Please summarize your findings and recommendations.

A. My primary findings with respect to the Project are as follows:

- GMP has a substantial need for new stably-priced power supply sources, primarily because the Company's two largest long-term power purchases (Vermont Yankee, and Hydro-Quebec Vermont Joint Owners Schedules B and C-3) expire in 2012 and 2015, respectively. These expiring sources presently provide over 75 percent of GMP's annual energy requirements, and most of the long-term price stability in our power supply portfolio.
- The Project is consistent with GMP's power supply strategy - which focuses on the themes of low cost, low carbon emissions, and high reliability for our customers. This strategy includes the acquisition (through power purchase agreements and/or ownership) of significant new renewable electricity sources including wind power, as cost-effectively as possible.
- If the Project is built to its maximum potential size of 63 MW, it will generate an estimated 149,000 MWh per year.[1] After accounting for a planned long-term sale of part of the Project's output to the Vermont Electric Cooperative, Inc. ("VEC"), GMP's share of

[1] Unless otherwise noted, I will refer to the Project's energy output in terms of wholesale MWh delivered to the bulk transmission system, net of all electrical losses. The amount of energy that the Project injects into the local transmission system will be slightly greater.

Project output is estimated at about 130,409 MWh per year, or about 6.5 percent of the Company's current annual energy requirements.

- The Project will provide a new long-term, stable-priced source in GMP's power supply portfolio that reduces our customers' exposure to potential future increases in electricity market prices and enhances the fuel and technology diversity of GMP's power supply portfolio. Unlike a typical power purchase agreement, the Project will provide this price stability without requiring GMP to provide collateral.
- The Project is projected to be among the most cost-effective new renewable electricity sources available to GMP. Over the Project's economic life, its projected cost per kWh is competitive with the prices of the most attractive potential new renewable purchases that GMP has identified, is lower than most of the recently established standard contract prices for small instate renewables, and is similar to GMP's most recent reference case outlook for the future price of energy, capacity, and RECs in the New England market.
- The Project's output is needed to serve the projected needs of GMP's customers that could not otherwise be provided in a more cost-effective manner through alternative power supply sources, energy efficiency, load management, or other demand-side measures. The Project is needed because the Company's two largest long-term power purchases will expire in 2012 and 2015, respectively, and some other existing power purchases will expire as well.
- The Project is consistent with state law that encourages increased use of

new instate renewable resources, including wind power, to meet Vermont electricity requirements. The Project will help to meet the state's substantial renewable energy goals cost-effectively.

- In addition to its direct benefits as a power supply resource for GMP, the Project will benefit electric customers in Vermont and New England by displacing the output of fossil-fired power plants in New England. This displacement will tend to reduce regional air emissions, reduce fossil fuel consumption, and reduce electricity market prices.
- The Project is consistent with the Company's approved IRP, which identifies new renewable generation as one of the types of electric supply resources that should have priority in the Company's power planning and procurement activities.
- The Project is consistent with the 2005 Vermont Electric Plan because it increases resource diversity, promotes clean and stable power sources and lowers the cost for electric service for customers.

GMP's Power Supply Portfolio

6. Q. Please summarize the primary features of the Company's current power supply portfolio.

A. Most of GMP's current power supply is obtained from long-term purchased power contracts. These arrangements are complemented by a mix of owned plants (instate hydroelectric and peaking plants, along with joint ownership shares in two out-of-state fossil-fired plants) and periodic purchases from the New England wholesale electricity market. The

portfolio is characterized by a high degree of price stability, and an air emission profile that is only a small fraction of the regional average.

The primary components of GMP's current power supply portfolio are as follows:

- A long-term, fixed price power purchase agreement for approximately 103 MW on a unit-contingent basis from the Vermont Yankee nuclear plant.
- A long-term, stably-priced purchase of system power from Hydro-Quebec. This 114 MW purchase provides a stable annual quantity of energy, at approximately a 75 percent annual capacity factor. Roughly two thirds of the energy from this source is delivered during peak hours, with the remainder delivered during off-peak hours.
- Several GMP-owned hydroelectric plants. These are primarily run-of-river sources, although some plants have a limited amount of storage. Output from these plants is significantly weighted toward winter and spring months.
- GMP's share of in-state small power producer purchases (from a combination of hydroelectric and biomass plants) through VEPPI, Inc.
- GMP-owned peaking plants at Berlin, Gorge, Essex and Vergennes. These are peaking units (simple cycle combustion turbine units and internal combustion engines) that burn primarily oil and are designed for on-demand use during peak hours. They provide a significant amount of GMP's capacity needs, but they operate very infrequently and provide only a very small fraction of GMP's energy needs.
- A combination of joint ownership and purchased power from the Stony

Brook combined cycle plant in Massachusetts, joint ownership in Wyman Unit 4 in Maine, and 11 percent joint ownership in the McNeil wood fired facility in Burlington, VT. These sources tend to be dispatched in an intermediate role, generating during the subset of hours when New England energy market prices exceed their variable costs of production. As a result, these sources presently provide only a limited share of GMP's annual energy needs.

- Long-term power purchase agreements from new renewable suppliers – presently including the Moretown landfill, a farm methane project in Westminster, and a small landfill project in Williston.
- System energy purchases with durations of up to five years. These purchases, which may be round-the-clock or shaped on a seasonal or peak/off-peak basis, serve primarily to provide price stability.

Exh. Pet.-DCS-1 illustrates the components of GMP's annual energy supply[2] for fiscal year 2009. While the elements of the portfolio can fluctuate from year to year (based on variances in load, generating unit outages, etc.), this recent year provides a reasonable indication of the *status quo*.

7. Q. Please describe how the Company's power supply mix is expected to change in the coming years.

A. The largest expected changes are that the Vermont Yankee and Hydro-Québec power purchase contracts (which together account for roughly three quarters of the annual

[2] Page 1 of Exhibit DCS-1 depicts GMP's 2009 energy supply before considering the sale of RECs; page 2 depicts the supply after GMP's actual REC sales. The difference is that about 2.5 percent of premium renewables, for which GMP sold the RECs, are depicted as market purchases.

energy supply) are scheduled to expire in early 2012 and late 2015, respectively. The VEPPI purchases are also scheduled to expire over approximately the next decade; the next large change will be expiration of the Ryegate wood-fired facility purchase (which represents roughly 6 MW of GMP baseload supply) in 2012.

GMP will need substantial new power supply arrangements to replace these expiring long-term contracts, and the required amount will increase to the extent consumption by GMP's customers increase over time. **Exh. Pet.-DCS-2** provides a comparison of the projected annual energy output[3] of the Company's committed power sources, plus the Project, to projected future energy requirements. This analysis assumes that Vermont will continue to pursue an aggressive package of energy efficiency measures and therefore the electricity consumption of GMP's customers will increase only modestly over the long-term, despite an increasing customer count.

Future Electricity Market Prices

8. Q. Please discuss the major factors influencing future electricity market prices and the causes of price uncertainty.

A. My discussion of electricity prices will focus primarily on electric energy,[4] because energy costs are by far the largest component of GMP's power supply costs. Energy market prices have historically been quite volatile, exhibiting marked fluctuations on daily,

[3] GMP's committed long-term sources all entail the physical production or delivery of energy. GMP's energy needs could also be met effectively using financial arrangements; the Company has historically used such arrangements for some shorter-term purchases.

[4] The reference to energy is limited to electric energy, as opposed to other fuel sources such as wood or fuel oil which are also consumed directly by end users.

monthly and annual bases. The primary reasons for this historical volatility include the following:

- Electricity market prices in New England and other regions are generally determined by the marginal price of production – essentially the highest-priced resources needed to meet electricity demand. The costs associated with plants operating on the margin vary widely, based on the range of technologies and fuels used.
- Fuel prices for price-setting electric generators (in New England, primarily natural gas, with lesser fractions of oil and coal) are quite volatile.
- Electricity cannot be easily stored on a regional or national basis - at least in sufficient quantities to smooth out the differences between relatively high-priced and low-priced hours.

Exh. Pet.-DCS-3 illustrates the variance in the monthly average energy spot market prices in the New England electricity market from 2003 to the present. It should be noted that the variation in prices for individual hours is much greater and more volatile.

In addition to the historic spot market prices for energy, the prices for energy to be delivered in the future are also volatile. **Exh. Pet.-DCS-4** illustrates the variance of forward energy market prices since 2005, for deliveries in calendar years 2009 through 2013. The values in each series represent the prices at which deliveries for a given calendar year could be purchased in advance, over a range of trading dates up to several years in advance of delivery. For example, the 2009 series indicates that the market price for round-the-clock energy for delivery in calendar year

2009 would have cost as much as $112/MWh (if purchased in mid-2008, about 6 months before the start of deliveries) or as little as $62/MWh (if purchased near the end of 2008, just before the start of deliveries).

The historical variance of both spot market and forward market prices demonstrates that energy market prices can change significantly over periods as short as a few months. Large changes in forward market prices are caused, in part, by changes in expectations relating to factors that significantly influence market prices, including natural gas prices, electricity demand, and environmental regulations. These factors (particularly natural gas prices and the potential for national regulation of greenhouse gas emissions in the electricity sector) can lead to similar or even greater price uncertainty in the long-term. This means that the price of energy to meet GMP's projected future requirements is quite uncertain, particularly for the period after 2015 that is not covered with committed sources. As a result, based on the currently committed power supply portfolio, the potential range of GMP power supply costs (and therefore the range of electricity rates that GMP customers could pay) is substantial.

9. Q. Please summarize GMP's current long-term outlook for future energy market prices.

A. GMP's April 2010 reference case energy market price outlook is set forth in **CONFIDENTIAL Exh. Pet.-DCS-5** (expressed in constant (2010) dollars and **CONFIDENTIAL Exh. Pet.-DCS-6** (nominal dollars). The reference case, which is intended to reflect a reasonable "most likely" outcome, was developed in consultation with La Capra

Associates.[5] The projected nominal levelized price for all-hours energy in the Vermont Load Zone in the reference case is approximately *****Begin Confidential Information***** [redacted] *****End Confidential Information***** over the first ten years of Project operation starting in 2013, and approximately *****Begin Confidential Information***** [redacted] *****End Confidential Information***** over 25 years.

The following are major input assumptions and results associated with the reference case:

- Henry Hub natural gas prices of *****Begin Confidential Information***** [redacted] *****End Confidential Information***** over the next decade, *****Begin Confidential Information***** [redacted] *****End Confidential Information***** by 2030. The basis differential to New England is assumed to remain constant in nominal terms, declining significantly over time in real terms;
- Additional New England new renewable electricity generation and imports over the next decade sufficient to meet projected renewable portfolio standard ("RPS") requirements;
- General inflation of about 1% in the near-term, next two years, increasing in 2013 to 2.4% for 5 years, and leveling out in the low-2% range for the long-term.
- An increasing likelihood that a national program substantially limiting greenhouse gas emissions in the electricity sector, such as the "Waxman/Markey" bill, will be implemented, and CO2 allowance prices on the order of *****Begin Confidential**

[5] La Capra has assisted GMP in several power supply planning efforts in recent years, including the development of GMP's 2007 IRP. La Capra also assists other Vermont utilities on power planning and transaction matters, and is well-grounded in the region's wholesale power market.

Information* [redacted] ***End Confidential Information*** by 2020, and ***Begin Confidential Information*** [redacted] ***End Confidential Information*** by 2030 (each price is expressed in $2010);

- Near-term energy market prices below $60/MWh;
- In the near term, a decline in electricity market prices relative to natural gas prices. This is due, in part, to the buildout of new renewable sources noted earlier;
- Electricity market prices over the longer term increasing significantly faster than the rate of general inflation, due to slowly increasing natural gas prices and increasing CO2 allowance prices.

10. Q. How does the GMP reference case energy market price outlook compare to other recent forecasts?

A. As **CONFIDENTIAL Exh. Pet.-DCS-7** shows, over the long term GMP reference outlook is significantly lower than several other price forecasts, the exception being one that assumes no national greenhouse gas emission limits. This difference in outlook is substantially attributable to lower assumed natural gas prices (based, in part, on GMP's use of more recent information) and lower CO_2 allowance prices (imputing higher probabilities to lesser or no greenhouse gas regulation and to technological advances that reduce the impact of regulation).

11. Q. What is your forecast for the future market prices of capacity and RECs?

A. The capacity market price outlook was developed by La Capra Associates, based on an assessment of regional capacity supply/demand trends and the estimated costs of market entry and exit for various capacity market participants. The La Capra outlook assumes that the New England capacity market will continue to be balanced (or surplus) for a number of years, with capacity market prices *****Begin Confidential Information***** [redacted]. *****End Confidential Information***** The capacity price forecast is contained in **CONFIDENTIAL Exh. Pet.-DCS-8.**

The REC market price outlook is based in part on information supplied by the consulting firm Sustainable Energy Advantage ("SEA").[6] I adjusted the SEA forecast by reducing REC prices by *****Begin Confidential Information***** [redacted], *****End Confidential Information***** to reflect the potential for political or regulatory changes in New England state RPS programs (e.g., reduction in RPS volume requirements). After 2025, I *****Begin Confidential Information***** [redacted] *****End Confidential Information***** due to renewable technology improvements and increasing power market prices.

The resulting REC price forecast is *****Begin Confidential Information***** [redacted] *****End Confidential Information***** from 2013 to 2020, and *****Begin Confidential Information***** [redacted].

[6] SEA's practice focuses on renewable energy markets and policy across the country. GMP is a subscriber to SEA's Renewable Electricity Market Outlook service, which focuses on the premium renewable markets in New England.

*****End Confidential Information***** GMP has assumed that after 20 years of Project operation, the market value of its RECs will be limited to $10/MWh.

GMP's Power Supply Strategy

12. Q. Please describe GMP's resource procurement strategy.

A. GMP has placed an emphasis on seeking a portfolio of resources that achieves three touchstone goals: low cost to customers, low carbon emissions, and reliable service (i.e., "Cost, Carbon and Reliability"). The plan includes the following components, which generally involve resources where Vermont utilities may have unique leverage or opportunities:

- Meaningful purchase and construction of new renewable generation;
- A long-term, cost-effective purchased power contract in declining amounts from Vermont Yankee if relicensed operation is determined to be safe and reliable;
- A long-term cost-effective power contract with Hydro-Quebec;
- Additional investments in cost-effective energy efficiency and demand-side management;
- Deployment of intelligent devices throughout the GMP system to improve the effectiveness of GMP operations, provide customers with usable consumption data, and support rate structures and other arrangements that enable customers to optimize their energy use;
- Exploration of opportunities to increase transmission capacity to import from Hydro-Quebec or other low-emission resources.

13. Q. Are the elements of this strategy consistent with GMP's Integrated Resource Plan ("IRP")?

A. Yes, they are. The Company's most recent approved IRP featured scenario and sensitivity analyses that evaluated a range of potential portfolio strategies from the perspectives of projected costs, potential cost variance, air emissions, and flexibility. The IRP indicated that robust GMP resource portfolios would likely include significant amounts of renewable generation, to the extent that they could be developed or purchased cost-effectively. The IRP therefore identified renewable generation as one of several supply priorities, and the IRP action plan included exploring opportunities for new renewable power sources.

14. Q. What are GMP's goals with respect to building long-term price stability into its power supply portfolio?

A. Approximately 90 percent of GMP's historic power supply resources, including Vermont Yankee, Hydro-Quebec, GMP-owned hydroelectric plants, VEPPI purchases, and GMP's joint ownership in the McNeil generating plant, involve prices that are fixed, relatively stable, or not tied closely to the wholesale market. The remaining 10 percent has come from periodic forward energy market purchases and participation in the Stony Brook and Wyman plants. As a result, GMP's portfolio has been largely insulated from market price changes and have been much more stable than those in neighboring states. Moving forward, GMP seeks to develop a portfolio that continues a very high degree of price stability in the near term (i.e., within two years of delivery). Over the longer term (i.e., 10 years in advance), GMP plans to

seek a substantial degree of price stability but less than in the past, in order to: (1) better balance the competing considerations of price certainty and avoidance of significant above-market costs, (2) avoid potentially large collateral posting requirements associated with long-term fixed-price contracts, and (3) manage the risks arising from a high concentration of retail load consisting of one customer. For a number of reasons outlined later in my testimony, the Project will be a suitable component of the stable portion of its power supply portfolio.

15. Q. Please summarize GMP's recent efforts to implement the goals of the IRP and its power supply strategy.

A. The Company recently entered into a Memorandum of Understanding with Hydro-Quebec for a long term power purchase agreement. It also has sought to purchase power from the Vermont Yankee plant, to the extent it is relicensed, but no agreement has yet been reached.

During the past several years GMP has also pursued new renewable generation, through long-term power purchase agreements with new renewable electricity sources (by means of bilateral discussions and a formal solicitation process) and has explored options to own new renewable power sources.

In collaboration with Central Vermont Public Service Corp. ("CVPS") and VEC, GMP participated in a widely distributed and inclusive Joint Utilities Request for Proposal process ("RFP#1"), which resulted in proposals from bidders in early 2009. The primary objective of the RFP was to attract proposals from all resource types and from resources that might otherwise not

participate in a smaller solicitation by requesting up to 100 MW (among the participating utilities) starting in 2012. The quality and variety of responses exceeded our expectations as thirty-three proposals were received representing over 1,800 MW of supply in virtually all fuel-type categories, including over 400 MW of offers from new renewable resources. As a result of this process, GMP entered into a long-term agreement to purchase 25 MW beginning in 2012 from the proposed Granite Reliable wind project in northern New Hampshire, at an initial price of ***** Begin Confidential Information ***** [redacted] ***** End Confidential Information ***** This agreement is presently being reviewed by the Board in Docket 7590.

During the past several years, GMP has also engaged in bilateral discussions with numerous proposed premium renewable projects in Vermont and neighboring states. These include other wind projects, along with projects based on other production technologies that include solar, new-build biomass, and retrofits of existing biomass plants.

GMP has also pursued ownership of renewable generation, in addition to its efforts to develop the Project. GMP's request to build a 200 kW solar plant at its Berlin generating site (to be completed in late 2010) is before the Board in Docket 7601. In addition GMP is pursuing two other solar projects: a net metered solar installations at our Montpelier Service Center 127 KW in size producing an estimated 38% of our electrical consumption needs at that location; and (in a cooperative effort with Shelburne Farms) a 154 kW solar array that would be group net metered.

In the past several years GMP has also increased capacity and associated energy output at its Essex and Vergennes hydro plants, in amounts of several hundred kW each which increased aggregate energy output by several thousand MWh per year. We also continue to explore improvements at other GMP-owned hydro sites

The Project is clearly the Company's largest initiative with respect to renewable generation ownership. If constructed, the Project would be GMP's largest renewable electricity plant, with an expected average annual output that would exceed the combined average annual output of GMP's existing hydroelectric plants.

The Project

16. Q. Please describe the Project.

A. Although the final turbine configuration has not yet been established, I understand that the capacity will be 50 to 63 MW. For purposes of this analysis, I have assumed an annual output of 149,000 MWh, which reflects the maximum project size of 63 MW.

GMP and VEC have agreed in principle to the terms of a long-term power sale agreement, under which VEC would purchase part of the Project's output. See **Exh. Pet.-CJP-5**. If the Project is developed to the maximum size of 63 MW, VEC would purchase 8 MW of output, leaving approximately 55 MW of output for GMP. The 55 MW share of project output would provide estimated net energy production of 130,409 MWh per year, which would represent about 6.5 percent of GMP's current annual energy requirements. The delivery point for energy into the

New England market is expected to be at a node defined by ISO-NE at a new VELCO Jay Tap Substation, which will interconnect the 46 kV line with the VELCO 115 kV transmission line system. For capacity, the Project is expected to be recognized in the ISO-NE "Rest-of-Pool" settlement and reliability grouping. Mr. Estey's testimony describes the physical interconnection.

From the perspective of GMP's power supply and its customers, the Project will function in essentially the same way as GMP's owned hydroelectric plants. The Project's fixed costs (including return of and on capital) will be included in the Company's regulated cost of service and paid for by GMP retail electricity customers. In turn, all of the value of GMP's portion of the Project's output, including energy, capacity, and renewable energy certificates ("RECs") over its economic life will flow to GMP customers.

17. Q. How much capacity value will GMP receive from the Project?

A. From a portfolio perspective, and in terms of estimated dollar value, the Project's most important products are clearly energy and RECs. Although the Project's average output during ISO-NE's peak summer months is projected to be below its annual average, and the output will be intermittent, I do expect that the Project will receive some capacity value in the Forward Capacity Market ("FCM"). The actual capacity value will depend on the Project's output during summer months; for planning purposes, I have assumed that this FCM capacity value will be on the order of 9 MW, or about 14 percent of the nominal project capacity.

18. Q. What is the projected cost of power from the Project?

A. As Mr. Pughe explains, the cost of power from the project is uncertain, depending on factors that include the specific transmission costs that will be required. Mr. Pughe therefore presents Alternative 1 and Alternative 2 scenarios for the cost of power from the Project. Mr. Kvedar's analysis indicates that the projected levelized cost of power from the Project over 25 years is 10.1 cents/kWh under the Alternative 1 scenario, and 11.5 cents/kWh under the Alternative 2 scenario. **Exh. Pet.-AJK-1, 4**.

Economic Benefit

19. Q. Will the Project provide an economic benefit to the State and its residents?

A. Yes. The Project will provide a new renewable generation source at a stable long-term price. As a result, it will increase the diversity of GMP's supply portfolio, in terms of technology and fuel source, together with GMP's existing 6 MW Searsburg wind plant and the proposed 25 MW Granite Reliable long-term wind PPA.

Since the Project will not incur fuel expenses or other variable operating costs, it will increase the stability of GMP's future power supply costs. New renewable sources, including the Project, can be excellent resources to provide long-term price stability, in a market in which long-term stable-priced options are limited. As a local source with no fuel expense, the Project is expected to provide about 6.5 percent of GMP's energy supply at a stable, cost-based price – without the type of collateral requirements that most stably priced market purchases would require.

20. Q. How does the projected cost of power from the Project compare to other new renewable generation alternatives?

A. I have reviewed the cost effectiveness of the Project's cost from three perspectives: (1) alternative renewable generation sources that are presently available; (2) the recently-established standard offer prices for small instate renewable sources; and (3) the projected future market prices of power and RECs.

The projected nominal levelized cost of power from the Kingdom Project is between 10.1 and 11.5 cents/kWh over 25 years. Either end of this range would represent one of the most cost-effective new renewable sources that GMP has explored through formal solicitations or bilateral discussions. The Project's projected cost of power is equal to or below the price of new renewable proposals that would deliver for a similar term. See **CONFIDENTIAL Exh. Pet.-DCS-9**. The only alternatives with materially lower levelized prices than the Project (for both the Alternative 1 and Alternative 2 scenarios) would deliver for much shorter terms, and therefore are not directly comparable to the Project.[7]

As indicated in **CONFIDENTIAL Exh. Pet.-DCS-9**, in addition to the estimated levelized price per kWh, there are several other key features of the potential renewable power sources that GMP reviewed. These include each source's location, delivery date and the approximate date of evaluation, along with observations related to the source's viability or cost-effectiveness. Some

[7] The Granite PPA does not include the sale of capacity for the first several years of the project's life. To facilitate comparisons with other wind projects (including the Kingdom Project), the levelized price presented here is adjusted to include capacity for the first several years at the projected market price. Because wind projects are expected to receive only modest capacity credit, this is a minor adjustment.

of these features can affect the relative cost-effectiveness and attractiveness of the potential sources.

21. Q. How does the projected cost of power from the Project compare to the recently established SPEED prices?

A. The range of projected cost of Project power is lower than the standard contract prices for most technologies, particularly for those technologies (i.e., solar and farm methane) that seem most likely to be developed soon and in significant scale. Although the output from some of the standard contract sources will be more valuable in the electricity market than wind (due to greater capacity value and less intermittence), this advantage is more than offset by the higher contract price.

22. Q. How does the projected levelized cost of Project power compare to your reference case estimate of its future market value?

A. The cost range for Project power is consistent with our current market outlook for the energy, capacity and REC products it will generate. The projected market value of the Project's output is *****Begin Confidential Information***** [redacted] *****End Confidential Information***** compared to estimated levelized costs of between 10.1 and 11.5 cents/kWh for the Project. See **CONFIDENTIAL Exh. Pet.-DCS-10** shows the estimate of market value.

The estimate of Project market value is based on the assumptions that (1) energy prices at the Project's location are two percent lower than Massachusetts Hub, which is consistent with historical experience for the Irasburg location, and (2) the value of Project output is reduced by two percent relative to the all-hours average market price (because Project output is weighted toward off-peak), and by *****Begin Confidential Information***** [redacted] *****End Confidential Information***** because the Project's output is intermittent.

23. Q. Does this mean that Project power will definitely be less costly than renewable market alternatives over its economic life?

A. No, it should be stressed that electricity market prices are volatile, and that there is a wide range of potential future electricity and REC market price outcomes. The Project's cost of power may exceed short-term market prices from time to time (particularly in its early years of operation), and potentially even over the course of its economic life as a whole.

To the extent that the cost of power from the Project turns out to be above market for an extended period, however, the effect on customers is likely to be offset by lower costs for other GMP sources, because a significant portion of those sources (e.g., future purchases, fossil-fired generating plants, market-indexed power purchase contracts) is expected to more closely follow market prices.

24. Q. Is the Project's instate location helpful from the perspective of GMP's power supply portfolio?

A. Yes. In general, power supply sources located within the state tend to be more effective hedges against future electricity market price changes than out-of-state sources. The energy revenues (i.e., locational marginal prices or LMPs) for instate projects are more likely to be well correlated with the Vermont load zone prices that Vermont utilities pay to meet their load requirements, and instate generation tends to lower local LMPs. This is an advantage for the Project, relative to more distant potential sources.

25. Q. Could the Project provide significant value to GMP customers after the initial 25-year period upon which your price comparisons are based?

A. Yes. If the Project's original equipment operates well for a period longer than 25 years, GMP will receive additional energy for some period of time while incurring only operation and maintenance costs (i.e., without a major new capital investment). Under such an outcome the effective cost of the Project's additional output would likely be well below then-current market prices, reducing GMP's net power supply costs.

It is also possible that at the end of the useful life of the Project's original equipment, it would be cost-effective for GMP to replace that equipment (i.e., repower the Project, which would likely have several advantages over a new-build wind project at that time, including: a permitted site with well-understood wind characteristics; an existing road, a functioning generation site and electricity collection system; existing transmission infrastructure with significant remaining life; and lease agreements with the land owners. These advantages tend to reduce the expected cost and risk profile of repowering the Project, relative to a new-build wind project.

These benefits are uncertain, because they will occur many years in the future and the actual value will depend on a range of factors that are difficult to predict today. Conceptually, however, the Project will provide a real option that GMP may exercise (by continuing to operate the plant and/or repower it) to the benefit of its customers. To the extent that wholesale power prices increase in the future and/or new wind sites are difficult to obtain, this option could have substantial value to customers, in terms of below-market power supply costs.

In conclusion, GMP considers the potential use of the Project and the site after 25 years to be a material advantage of Project ownership relative to the acquisition of wind power via purchased power agreements (which do not provide any residual value to GMP after their expiration). This additional long-term value associated with the Project represents an economic benefit to the state and its residents.

26. Q. Does GMP expect to sell the RECs that the Project generates?

A. GMP expects that absent a change in Vermont law, it will sell most or all of the Project's RECs to entities in neighboring states that will ultimately retire them for compliance with RPS requirements. For context, GMP presently sells most of the RECs associated with its premium renewable sources in this manner.[8]

[8] These resources include the Searsburg wind plant, a long-term PPA from the Moretown landfill facility, and the McNeil plant. Consistent with the terms of its voluntary green rate, GMP retires sufficient premium RECs from instate renewable sources to cover the consumption of its green rate subscribers. This ensures that the subscribers' payments have the desired effect of increasing the content of instate renewables in GMP's power supply.

Vermont utilities may face a mandatory RPS requiring them to retire rather than sell RECs. This could occur under existing law if the state fails to achieve the near-term objectives of the SPEED program (e.g., 5% of 2005 sales by 2012), or if in the future Vermont adopts a traditional RPS program similar to those in neighboring states. In considering this possibility, I observe that the current SPEED construct of selling RECs (thereby minimizing retail electric rates) is in tension with other Vermont goals regarding air emissions and reduction of greenhouse gas emissions. Specifically, to the extent that Vermont utilities sell the RECs associated with renewable sources like the Project, they are no longer able to claim those sources' renewable content and their low/zero emission profile.

In my view there is a significant chance that in the future, Vermont utilities will be expected or required to retire (not sell) RECs from new renewable sources like the Project. Because the Project will provide GMP all output (including power and RECs), it will serve as a hedge against such potential changes in Vermont energy policy. GMP will have the flexibility to cost-effectively address a future Vermont RPS by retiring Project RECs, rather than having to purchase RECs at a time when more costly projects may be setting the market.

Potential Risks Associated With the Project and the Value of its Output

27. Q. Will the amount of energy that the Project produces be a significant determinant of its cost-effectiveness as a power supply resource?

A. Yes. Unlike purchased power resources in which the amount paid varies with the amount of energy delivered, GMP's Project costs are primarily fixed, irrespective of the actual

amount of Project output. As a result, an important risk for the Project is that the actual energy production could turn out, over the long-term, to be less than expected. This would increase the Project's effective cost per kWh. Of course, actual production above the levels assumed in Mr. Kvedar's analysis would lower the effective cost of Project power.

To explore how the cost-effectiveness of the Project's power would be affected if its actual output turned out less than projected today, I tested (with Mr. Kvedar's assistance) an alternative case assuming that the Project's output would be 5 percent lower than GMP's current estimate. This change increased the Project's estimated cost of power to between 10.7 cents/kWh and 12.2 cents/kWh. This range would still place the Project among the most cost-effective potential new renewable sources that GMP has encountered.

28. Q. What are some of the leading outcomes that could cause future REC market prices to turn out lower than today's outlook?

A. While it would be impossible to identify and discuss the full range of potential market outcomes, one leading example of such an outcome would be that high energy market prices (for example, due to high natural gas prices and/or national greenhouse gas emission limits) cause REC market prices to turn out lower than expected. In this case more of the Project's value would be derived from the energy market (and less from RECs), with the total market value of the Project's output being relatively close to today's outlook.

Alternatively, REC market prices could turn out lower than expected due to sustained high supply or reduced demand developments in state RPS markets. The most likely driver of an outcome of this type would be political and regulatory changes in neighboring states that would change the structure or details of their RPS programs. It is difficult to handicap the likelihood of such policy-driven declines in REC market prices, and how large and long-lasting they would be. But the Board should be aware that potential REC revenues from the Project (and from all other new renewable sources) are uniquely subject to political developments in neighboring states.

29. Q. Have you presented these examples because you believe that the Project will turn out to be an above-market renewable supply source for GMP?

A. No. The Project is one of the most cost-effective new renewable sources that GMP has encountered, and I believe that our market outlooks for energy and REC prices are reasonable and appropriate based on the information available today. In fact, as I discussed earlier, each GMP outlook was developed by reducing a recent consultant-provided price outlook. For these reasons I believe that over its life, the Project is more likely than not to turn out to cost less than market prices for power and RECs from premium renewable sources. I provide the examples above to emphasize the substantial uncertainty of future market outcomes for power and REC market prices. The primary power supply rationale for the Project is not to "beat" the single stream of market price outcomes that actually occurs (or today's outlook for those prices), but rather to bring price stability to GMP's portfolio – thereby helping to manage the exposure of GMP's customers to the range of uncertain future market outcomes.

30. Q. Aside from the uncertainty in REC market prices, is it possible that GMP could be precluded from selling some or all of the RECs produced by the Project?

A. Yes. Demand for RECs from new renewable sources in New England is presently driven overwhelmingly by buyers seeking to comply with RPS programs – primarily in Massachusetts and Connecticut – which use retirement of RECs as the primary compliance mechanism. I am aware of two potential grounds upon which other states could conceivably seek to exclude Project RECs from RPS eligibility: concerns about Vermont's SPEED program, and the fact that the Project will be utility-owned. In my view there is some likelihood (although it is not possible to quantify with confidence, and my sense is that it is limited) that one or more of these states could declare some or all of the Project's REC output to be ineligible for use to comply with their respective RPS programs. If this were to occur in multiple states, the market for the Project's RECs (and the potential sale revenue) could be seriously reduced.

These risk factors are the primary ones that I had in mind when I chose a reference case. REC market price outlook that is somewhat lower than recent consultant-generated outlooks, and lower in real terms than prices observed in the Massachusetts market during much of the past several years. That is, because the REC market is uniquely subject to political or regulatory developments in other states, I have attempted to reflect the potential for such developments to reduce the value of the Project's RECs. The GMP reference case outlook is not, however, a worst case outlook. In the context of Vermont's current renewable energy policy (which includes the sale of RECs for the financial benefit of customers), it is important for the Board to note that the REC revenue stream will feature some risk of lower-price outcomes associated with unique political/regulatory uncertainties that are largely outside of GMP's control.

31. Q. Will the Project's output be intermittent?

A. Yes. The Project's actual output during individual hours and days can fluctuate greatly around monthly average values based on actual wind conditions. Output during individual hours will vary from near zero to the project's nominal capacity. Over weeks and months, the hours of high and low production will tend to offset, with the Project's output converging toward the long-term averages.

32. Q. How do you expect the project to perform as a hedge in GMP's portfolio?

A. As noted above, the cost of power from the wind project is expected to be relatively stable because it does not need to incur any fuel expenses, and the energy output should be fairly stable over long periods. As a result, the Project can be expected to be an effective hedge against the influences (e.g., natural gas prices, national greenhouse gas emission limits and allowance costs, regional electricity supply/demand changes) that affect market prices across most or all hours of the year. Importantly, these are the drivers and uncertainties that affect long-term electricity market prices the most. The Project's output can therefore be expected to protect GMP customers from long-term market price variations – not as effectively as a fixed block of energy or a diverse portfolio of generating units, but reasonably close.

33. Q. Is wind power an effective hedge against all types of market price risk?

A. No. The intermittence of the Project's output will tend to reduce its effectiveness as a hedge against electricity market price changes of very short durations. In particular, I expect that the Project will be a less consistent hedge against temporary extreme energy price "spikes"

that can occur (typically for a few hours at a time) during periods of extremely high electricity demand and/or outages of major generating units. This is because it is possible that during the few hours of the price spike, the wind may not be blowing.

The financial impact of such low wind production events on GMP's portfolio will be limited by the fact that in the New England electricity market, large energy price spikes are relatively infrequent. It is also notable that GMP's existing portfolio contains substantial amounts of intermediate and peaking capacity that can be utilized during infrequent instances of market price spikes combined with low wind output.

34. Q. How may the wind's intermittence affect GMP's power supply costs?

A. As discussed above, the introduction of this new resource with zero variable costs will tend to stabilize GMP's long-term power supply costs. This will be the primary effect of adding the Project to GMP's portfolio.

Variations in wind output around the long-term average will have a noticeable effect on the Company's net power supply costs on a shorter-term basis (i.e., over periods from a month to a year), like variances in the output of the Company's existing hydro plants do today. Unlike some wind-based power purchase agreements, under which the buyer pays based on the amount of energy produced each month, GMP and its customers will face the same fixed costs of the Project each month, whether actual wind conditions cause the energy output to be above or below the long-term average. Over time these variances in wind output will tend to average out,

as they do for GMP's hydro plants. But over time frames this short, GMP's portfolio costs will be more variable than they would be if GMP were to purchase the same energy volumes from, say, a fixed block of system energy or a wind PPA with energy-based pricing. For purposes of comparing the cost of power from the Project to the Company's market price outlook or to alternative non-intermittent sources, I have reduced the projected market value of the Project's energy output by *****Begin Confidential Information***** [redacted]. *****End Confidential Information*****

Section 248 Criteria

35. Q. Does the Project meet a need for present and future demand for service that could not otherwise be provided in a more cost effective manner through energy conservation programs and measures or energy efficiency and load management measures, as required under (30 V.S.A. § 248(b)(2))?

A. Yes. As I have explained, about three quarters of GMP's current power supply sources will expire between 2012 and 2015, leaving GMP with a need for substantial new resources, particularly long-term resources that provide price stability.

36. Q. Does the Project result in an economic benefit to the state and its residents, as required by 30 V.S.A § 248(b)(4)?

A. Yes. As indicated above, the Project will benefit GMP's power supply portfolio in a number of ways (including long-term price stability without collateral requirements, fuel and technology diversity, and long-term value of ownership), and its projected cost of power

compares favorably to alternative sources of new renewable generation. In addition to the benefits for GMP's power supply, the Project will have the economic benefits set forth in the prefiled testimony and exhibits of Mr. Kavet.

37. Q. As required in 30 V.S.A § 248(b)(7), is the proposed Project in compliance with the electric energy plan approved by the department under Section 202 (i.e. the DPS 2005 Vermont Electric plan)?

A. Yes. The Project is consistent with the priorities for the future emphasized in Section 10, which relates to increasing resource diversity and promoting clean and stable sources. It is also consistent with the State's priority of lowering the cost for electric service, because it is a stable-priced and competitively priced renewable power source. The Project will hedge against potential high electricity market outcomes (driven, for example, by fossil fuel price increases and/or national emission reduction requirements), and against the realistic possibility that in the future GMP will be required (by state or national law) to procure significant amounts of its electricity supply from new renewable sources.

38. Q. Is the Project consistent with the principles for resource selection contained in GMP's IRP under 30 V.S.A § 248(b)(6)?

A. Yes. The Project is consistent with the resource selection principles and GMP's IRP, as indicated above.

39. Q. Will the Project help achieve Vermont's renewable electricity goals?

A. Yes. It is consistent with, the state energy goals under 30 V.S.A. § 8001 of providing an incentive for Vermont utilities to procure affordable, long-term, stably priced renewable energy, developing viable markets for renewable energy and energy efficiency projects, and contributing to reductions in global climate change and anticipating the impacts on the state's economy that might be caused by federal regulation designed to attain those reductions. The Project will also support GMP's efforts to meet the state's goal of 20 percent of statewide electric sales before July 1, 2017 being met with SPEED resources (30 V.S.A. § 8005(d)(2)).

40. Q. Are there other beneficial impacts of the Project?

A. Yes. Subject to operating constraints, New England generating plants are dispatched by ISO-NE, generally in ascending order of bid price and new resources with low operating costs (such as the Project) enter the "stack" of energy bids at the bottom. As a result, the Project will reduce the amount of production that is needed from higher-cost marginal generating units. In New England, the marginal generating units during most hours burn natural gas. The other primary marginal sources are oil-fired and coal-fired units, along with inter-regional transactions, which also tend to be supported by fossil-fired plants. This displacement reduces fossil fuel consumption and air emissions of electric generators and reduces ISO-NE energy market prices. In some hours, energy displacement may have little or no effect on the energy market price, because the marginal (price-setting) resource remains the same, but in other hours, displacement will cause a lower-cost generating resource to become the price-setting one, resulting in a lower LMP.

In the near term, it is reasonable to expect that new wind power like the Project will displace the output of marginal fossil-fired units, through the process of ISO-NE economic dispatch summarized above. Based on the most recent NEPOOL Marginal Emissions study,[9] which shows a regional marginal emission rate of roughly 1,000 lbs of CO_2 per MWh. I estimate that in the near term, the Project will displace regional power plant emissions of CO_2 by about 72,000 tons per year. Over time, there is an increasing likelihood that the Project will displace or defer future potential additions of new generating capacity or accelerate the retirement of aging existing generating capacity, thereby producing similar beneficial effects. In the longer term, using the emission rate associated with a new, efficient gas-fired combined cycle plant (which I have assumed at 800 lbs of CO_2 per MWh) as a proxy, I estimate that the Project will displace regional emissions by about 60,000 tons per year.

41. Q. What is the impact on Project benefits of a "cap and trade" emission regulation program (such as the existing Regional Greenhouse Gas Initiative ("RGGI") or a mandated cap on emissions?

A. First and most importantly, zero-emission wind generation is expected to be a primary tool for achieving regional and/or national emission targets under "cap and trade" programs. Substantial amounts of additional wind power will be needed to most cost-effectively meet the aggressive emission reduction targets that have been discussed during the past year in the context of potential national climate change legislation. Second, the implementation of non-emitting sources like the Project could enable policymakers to lower the emission cap under a

[9] *2007 New England Marginal Emission Rate Analysis*; July 2009.

"cap and trade" program in the future. Under "cap and trade" emission programs, new wind generation will also put downward pressure on emission allowance prices (and thereby wholesale electricity prices). Because Vermont distribution utilities like GMP (as well as other electric distribution utilities in the region) tend to be net buyers of wholesale electricity, lower allowance prices will tend to reduce power supply costs.

42. Q. Does this conclude your testimony?

A. Yes.